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PRE-COMMERCIAL THINNING NOT RECOMMENDED FOR VIRGINIA PINE STANDS IN SOUTHERN MARYLAND

Virginia pine *(Pinus virginiana* Mill.) normally develops such dense stands on suitable sites, as in old fields, that thinning would seem to be a good silvicultural practice. Seedling stands may have 10,000 or more stems per acre, and stands 20 years old may still contain 2,000 trees. Even though rapid differentiation of crowns occurs in this intolerant species, resulting in early suppression of many stems and much mortality, thinning still might be expected to favor the development of greater volumes or more valuable products.

However, the results from past studies of thinning Virginia pine have been somewhat conflicting, and consequently do not provide firm guides to desirable types of thinning, or even to the advisability of thinning. In North Carolina, Slocum and Miller (1953) released 6-year-old crop trees and 9 years later found that they contained more than twice the volume of unreleased crop trees. But after a 15-year-old stand was thinned, little difference in the growth of released and unreleased crop trees occurred in 14 years. Several other authors (Bramble 1953, Whitesell and Pickall 1956, and Williamson 1953) also concluded that thinning had to be done while stands were young if any appreciable growth response were to be obtained.

In contrast, Rushmore[1] thinned 15-, 25-, and 30-year-old stands and got not only a growth response, but essentially the same response, at all three ages — about 0.4 inch more radial increment in 10 years in released than in unreleased crop trees. And in Virginia, Hoekstra and Hutchinson

[1] Rushmore, F. M. THINNING VIRGINIA PINE IN MARYLAND — A 10-YEAR EXPERIENCE. Unpublished report, Northeast. Forest Expt. Sta., 1949.

(1963) found that the first-year responses in diameter growth of released Virginia pines 10-14, 15-19, 20-24, and 25-29 years old were comparable, varying only between 0.05 and 0.07 inch among all the sampled ages.

Even if individual-tree responses were similar over a range of ages, the overall effects of thinning ordinarily would differ with stand age because of varying amounts of storm damage. Windthrow is particularly common in partially cut stands of pole-size or larger Virginia pine. Thinned stands of sapling-size trees are highly susceptible to damage by ice or wet snows. Consequently, the results reported by some authors (Slocum and Miller 1953, and Fenton and Bond 1964) suggest that, if thinning is to be done in Virginia pine, only pre-commercial thinning at an early age — preferably around 5 to 7 years — should be considered.

To provide some additional information on the response of young Virginia pine stands to thinning, the Maryland Department of Forests and Parks and the Northeastern Forest Experiment Station started a study in Maryland's Cedarville State Forest in 1953, using stands 7 and 17 years old. In both age classes thinning to 900 trees per acre versus no thinning was compared. Methods and 10-year results are summarized below.

Study Methods

Blocks of plots were located in well-stocked pure stands of both ages on well-drained sandy loam soils. At the start of the study the 17-year-old stand contained about 2,900 stems per acre and the 7-year-old stand about 9,500 stems per acre.

When the treated plots were thinned to 900 trees per acre, the resultant spacing was about 7 feet. Residual trees were at least codominant before thinning. Cut stems were lopped and the slash was scattered. In the control plots an equal number of trees in the dominant-codominant crown classes were marked for future comparisons of mortality and growth.

The plots in both stands were small, and they were clustered rather than randomized by treatment. In the 17-year-old stand a group of four 0.05-acre plots, with a 0.5-chain isolation strip around each one, was thinned; four untreated plots of the same size were in a group 1 chain away. The arrangement in the 7-year-old stand was similar, except that only two treated plots and two check plots were established.

Diameters (b.h.) of crop trees were measured to the nearest 0.1 inch at the time of establishment and after 5 and 10 years. Heights of the 10 tallest crop trees per plot (equivalent to 200 trees per acre) were measured in each plot of the 7-year-old stand in each tally, but only in the 10-year remeasurement of the older stand. In the last tallies, some of the

Figure 1. — The 17-year-old stand 5 years after thinning: Above — a treated plot; below — a control plot. Ice and snow damage, which amounted to a 19-percent loss of crop trees, is evident in the thinned plot and absent in the other. Note also that a hardwood understory has developed in the thinned plot but not in the unthinned plot.

larger trees that had not been originally selected in the control plots were also measured.

The data have been summarized on the basis of 900 and 200 crop trees per acre. The 900 stems are roughly equivalent to the stocking in stands when harvested for pulpwood, and 200 is about the number of trees that would be left if allowed to grow to sawlog size.

Mortality

The 10-year mortality among the 900 crop trees in the 17-year-old thinned stand was severe, averaging 31 percent as compared with 14 percent in unthinned controls. More than half of the loss in the thinned plots occurred in the first 5 years, and most of it was due to destructive weather (fig. 1). In the control plots all the mortality of selected trees occurred in the second 5-year period and is attributed to competition.

In the 7-year-old stand, losses in the thinned plots were only 4 percent during the 10-year period. The four trees that comprised this loss were clustered, which suggests bark beetles as the probable cause of death. In contrast, the 10-year losses among selected trees in the control plots were equivalent to 270 trees per acre, or 30 percent. Less than one-fourth of this mortality occurred during the first 5 years.

The comparative mortality of crop trees in our thinned stands agrees with the findings of Slocum and Miller (1953) in North Carolina. They concluded that thinning is not practical in stands 12 or more years old, largely because of the hazards of ice and wind damage.

Diameter and Basal-Area Growth

900 crop trees per acre. — Surviving crop trees in the 17-year-old stand made 50 percent more diameter growth during the 10-year period in the thinned plots than in the unthinned ones (1.5 inches versus 1.0 inch). However, because of greater mortality in the thinned plots, basal-area growth of the crop trees did not differ appreciably on a per-acre basis: 25.1 versus 22.8 square feet per acre for thinned and unthinned plots, respectively (table 1, A).

In the 7-year-old stand the situation was reversed: here the high mortality was in the check plots. As in the 17-year-old stand, the trees in the thinned plots gained appreciably more in diameter in 10 years than the selected crop trees in the check plots — 2.3 inches versus 1.7 inches (table 2, A).

However, many of the originally selected trees in the check plots were

Table 1. — Ten-year changes on thinned and unthinned plots in a 17-year-old Virginia pine stand

(Based on a stocking of 900 crop trees per acre after thinning and an equal number of comparable trees marked on the unthinned plots: A — in terms of all survivors among the selected crop trees; B — in terms of the 200 largest trees per acre)

	Thinned			Unthinned		
Stand age	Trees per acre	Average diameter (b.h.)	Basal area per acre	Trees per acre	Average diameter (b.h.)	Basal area per acre
Years	*No.*	*Inches*	*Sq. ft.*	*No.*	*Inches*	*Sq. ft.*
		A. 900 CROP TREES PER ACRE				
17	900	3.2	49.6	900	3.0	45.0
22	725	4.2	69.3	900	3.6	64.0
27	625	4.7	74.7	775	4.0	67.8
10-year changes:	—275	1.5	25.1	—125	1.0	22.8
		B. 200 LARGEST TREES PER ACRE				
17	200	4.1	18.6	200	4.0	17.0
22	200	5.4	31.8	200	4.8	25.1
27	200	5.9	37.7	200	5.2	29.7
10-year changes:	0	1.8	19.1	0	1.2	12.7

not among the largest trees 10 years later. When we disregard the original selections and pick the largest trees in numbers to match survival in the thinned plots (860 trees per acre), we find that these trees had grown fully as well as the thinned ones. Their average 10-year increase in diameter was 2.3 inches — the same as for the thinned trees. And their increase in basal area per acre was 52.8 square feet — slightly more than the 50.5 square feet registered by the thinned trees. Thus, despite the apparent growth benefits from thinning, when thinned and unthinned stands as a whole are compared, thinning did not result in any real gain.

200 largest trees per acre. — The 200 largest trees per acre (at the time of each tally) showed greater average response to thinning than did all survivors of the 900 trees per acre. Mortality was not a factor when considering the 200-tree group. Consequently, in the 17-year-old stand, the 10-year growth in both diameter per tree and basal area per acre was

Table 2. — Ten-year changes on thinned and unthinned plots in a 7-year-old Virginia pine stand

(Based on a stocking of 900 crop trees per acre after thinning and an equal number of comparable trees marked on the unthinned plots: A — in terms of all survivors among the selected crop trees; B — in terms of the largest 200 trees per acre among original selections)

	Thinned			Unthinned		
Stand age	Trees per acre	Average diameter (b.h.)	Basal area per acre	Trees per acre	Average diameter (b.h.)	Basal area per acre
Years	*No.*	*Inches*	*Sq. ft.*	*No.*	*Inches*	*Sq. ft.*
		A. 900 CROP TREES PER ACRE				
7	900	1.2	6.8	900	1.4	10.2
12	860	2.7	35.0	840	2.6	31.6
17	860	3.5	57.3	630	3.1	33.2
10-year changes:	—40	2.3	50.5	—270	1.7	23.0
		B. 200 LARGEST TREES PER ACRE				
7	200	1.6	2.6	200	1.9	4.1
12	200	3.4	12.7	200	3.6	14.1
17	200	4.4	21.4	200	4.3	20.0
10-year changes:	0	2.8	18.8	0	2.4	15.9

about 50 percent more in the treated plots than in the controls (table 1, B). Differences in the 7-year-old stand were much less — only about 16 percent more in diameter growth and 18 percent more in basal-area growth in the treated plots (table 2, B).

Differences in height growth in this stand were minor: the thinned trees increased from 13.2 to 27.5 feet in the 10-year period, and the unreleased trees increased from 14.0 to 29.6 feet.

Discussion and Conclusion

The results from this study do not warrant a recommendation for thinning Virginia pine stands at either of the represented ages. In the stand thinned at 17 years, the individual trees showed an appreciable increase in growth, but on a per-acre basis this response was offset by greater mortality on the thinned areas, largely because of lowered resistance to storm damage. In the younger stand, the trees of the thinned plots and

the largest trees of the unthinned plots did not differ much in either individual diameter growth or basal-area growth per acre. In view of these results and the fact that Virginia pine is primarily a pulpwood species, non-commercial thinnings such as were made in this study do not seem to be justified in similar dense stands of southern Maryland.

Militating further against thinning is the increased development of hardwood understories when the pine overstory is reduced, as is evident in figure 1. This would definitely increase the cost of reproducing pine after harvest cutting.

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